

# Maryland High School Career and Technology Education Programs of Study

## CAREER AND TECHNOLOGY EDUCATION



EDUCATING TOMORROW'S WORKFORCE TODAY



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# Career and Technology Education (CTE): Educating Tomorrow's Workforce Today

Career Technology Education (CTE) provides high school and community college students an opportunity to pursue a sequential technical and academic program of study leading to advancement in a career field. High school CTE programs of study give students the opportunity to transition smoothly into further education or postsecondary education and to earn college credit and/or industry credentials in a career field of interest.

Maryland leads the nation in the redesign of CTE programs as called for in the federal Carl D. Perkins Career and Technical Education Improvement Act of 2006. The Maryland State Department of Education (MSDE) works closely with the Governors Workforce Investment Board (GWIB) to identify new programs in response to Maryland's workforce development needs and to ensure all CTE programs of study keep pace with industry expectations and prepare students for their next steps toward college and careers.

## Career Clusters: The New Career Technology Education (CTE)

MSDE in partnership with statewide industry advisory groups, identified ten (10) **Career Clusters** that represent core business functions across broad industry areas in Maryland. Business partners further identified **career pathways** based on the end-to-end business processes within career clusters. This representation of industry clusters and career pathways is provided in the MSDE publication *Maryland Career Clusters: Restructuring Learning for Student Achievement in a Technologically Advanced, Global Society*<sup>1</sup> and serves as a starting point for the identification of Maryland CTE programs of study.

Career Clusters allow students to explore a wide range of career options and to apply academic and technical skills in a career area. Career Pathways are like road maps of learning that help students plan for and pursue further education and careers.

Using the Career Clusters Framework to develop new CTE programs at the high school helps students gain a better understanding of the world of work and what is required to prepare for a career. Each Career Cluster includes at least two CTE program options for students to gain more advanced understanding and preparation for a career field. For example, the chart below depicts the wide range of career fields in the Arts, Media, and Communication industry in Maryland. Students may choose from three CTE programs or arts-based programs to further explore these careers.

### Maryland's CTE Career Clusters

- Arts, Media, and Communication
- Business Management and Finance
- Construction and Development
- Consumer Services, Hospitality, and Tourism
- Environmental, Agricultural, and Natural Resources Systems
- Health and Biosciences
- Human Resource Services
- Information Technology
- Manufacturing, Engineering, and Technology
- Transportation Technologies

### Industry Career Pathways

Multimedia Production

Graphic Design/Printing

Film and Radio

Broadcast Journalism

Visual Arts

Performing Arts

Public Relations

### High School Programs of Study

Interactive Media Production

Graphics and Printing Communication Technology

Communication and Broadcast Technology

Art, Music and Drama courses and programs are offered through the high school art department. These are not CTE programs of study.

<sup>1</sup>For more information about Maryland's Career and Technology Education programs, go to [www.MarylandPublicSchools.org](http://www.MarylandPublicSchools.org). Click first on Divisions and then on Career and College Readiness.

**“The people of Maryland are our greatest asset, and our continued economic strength depends upon our ability to invest in them and prepare our children today for the jobs of tomorrow.”**

**- Governor Martin O'Malley**

## Maryland CTE Programs of Study

Maryland CTE programs of study are statewide model programs designed to prepare high school students for the 21st Century's global economy and its rapidly changing workforce needs. All CTE programs are aligned to established academic and technical skill standards to ensure student preparation for college and careers. These programs also include work-based learning opportunities (e.g., internships, clinical experiences, or industry-mentored projects) tied to the student's area of interest. Upon completion of a Maryland CTE program of study, students also have the option to earn college credits and/or industry-recognized credentials such as certifications and licenses.

The Maryland CTE programs of study outlined in this document serve as a resource for local school systems and their community college partners. The programs included in this document are MSDE-developed programs designed with state and national-level partners, are standardized across the state and include opportunities for state-wide professional development for teachers. For each Career Cluster, MSDE has identified several new Maryland CTE programs of study for development. Most of the programs listed have been completed and are offered throughout Maryland. However, several programs are currently under development. Please review the program descriptions for specific information regarding each Maryland CTE program of study.

The Maryland State Department of Education, in collaboration with business, higher education, and local school systems provides guidance and support for the ongoing development of rigorous and relevant CTE programs of study that prepare students for both college and careers. Local school systems are encouraged to adopt the Maryland CTE programs of study outlined in this publication and to partner with higher education in supporting student transition to postsecondary education and careers. The MSDE is also collaborating with school systems, business and higher education to develop and expand CTE programs in high-demand careers, such as those in the Science, Technology, Engineering and Mathematics (STEM) disciplines.

Given that CTE programs are closely aligned with regional economic and work-force development priorities, not all high schools have programs in all career clusters. Based on local needs and opportunities, each school system decides which clusters and corresponding CTE programs to offer. For more information about local CTE programs of study, please contact the local school system or go to [www.MarylandPublicSchools.org](http://www.MarylandPublicSchools.org) for a link to the school district's web site.

## Preparing Today for the Jobs of Tomorrow

CTE programs are designed to support students in making decisions about education and career options. While students generally enroll in a CTE program in 10th or 11th grade, career exploration begins far earlier. In middle school, students participate in career-awareness activities—for example, field trips, job-shadowing, interest inventories—and develop high school plans, mapping out academic coursework and career options.

Today, high school students face many options for academic growth and career exploration. Making informed choices about their high school program of study will prepare them for success in further education and lead to a rewarding career. Students may learn more about career opportunities for Maryland graduates at [www.BeWhatIWanttoBe.com](http://www.BeWhatIWanttoBe.com).

**BeWhatIWanttoBe.com**

**Be What I Want To Be**

Try on a future, see what fits

## Program Highlight: Career Research and Development (CRD)

To support students in learning about careers, work-based learning opportunities are made available to all CTE students. Supervised work-based learning experiences allow high school students on-the-job training related to their career choice. Students may also elect to complete the work-based learning CTE program, *Career Research and Development (CRD)*. The program is designed to link the classroom with specific work experiences and includes two school-based courses followed by at least two work-based learning credits (generally in the last year of high school). These experiences are organized around a work plan that is cooperatively developed by the school coordinator and employer to add value to and extend a student's career preparation. Students in CRD can be placed in positions related to any of Maryland's 10 career clusters.



# Sample High School Program of Study

Students electing to complete a CTE Program as part of the high school program are prepared for entry into college and a career pathway. The chart below shows a typical high school program of study that includes a CTE Program Sequence beginning in Grade 10. It also depicts how students can earn industry certification and/or college credit while in high school.

High School Program					College Program
Requirements	Grade 9	Grade 10	Grade 11	Grade 12	
English - 4	English 9	English 10	English 11 AP Language	English 12 AP Literature	English/Language Arts <i>Include AP credit options</i>
Social Studies - 3	US Government	World History AP European	US History AP US History	Government AP Govt.	Humanities/Social Sciences <i>Include AP credit options</i>
Mathematics - 3	Algebra I	Geometry	Algebra II	Trigonometry or Pre-Calculus or Calculus or AP Calculus	Mathematics <i>Include AP credit options</i>
Science - 3	Earth or Physical Science	Biology or AP Biology	Chemistry or AP Chemistry	Physics or AP Physics	Science <i>Include AP credit options</i>
Physical Education - .5 Health Ed - .5	.5 PE	.5 Health			
Fine Arts - 1	.5 Fine Arts	.5 Fine Arts			
Technology Education - 1	Foundations of Technology				
CTE Completer Program - 4		CTE Program Sequence			CTE Program Concentration Include articulation options <ul style="list-style-type: none"> <li>• Dual Enrollment</li> <li>• Credit by Exam</li> <li>• Pre-Apprenticeship</li> </ul>
		CTE Course (1)	CTE Course (1)	CTE Courses (2)	
Foreign Language - 2 and/or Advanced Tech Ed - 2	Foreign Language	Foreign Language	Foreign Language or Adv. Tech	Foreign Language or Adv. Tech	

In Maryland, all secondary and postsecondary programs are offered in related programs of study to advance student preparation and success in a career. However, specific program offerings vary by location. Contact the local school systems and/or community colleges who work together to identify areas of interest and program requirements.

In most CTE programs, the awarding of college credit and/or industry certification requires students to meet pre-determined standards and assessments as determined by the postsecondary institution and/or industry. A description of these requirements and opportunities for college credit and/or industry certification is included for each CTE program of study.



## Arts, Media and Communication

Maryland offers great opportunities for careers in the Arts, Media and Communication Career Cluster. Students interested in this cluster combine creative abilities with technical skills and knowledge that prepare them for careers in: Broadcast Production, Graphic Communications, Web Design, Interactive Media and Game Design. Maryland CTE programs include a focus on mass communication and broadcast journalism, graphic communication, and multimedia production. Working with people from the industry helps ensure that our programs keep pace with the industry. These programs include options for students to earn industry certifications and college credit toward advanced study in the career field.

### High School CTE Program

### CTE Program Description:

#### Communication and Broadcast Technology

*The Communication and Broadcast Technology program* is currently under development. This program builds on current CTE programs and will provide students the opportunity to apply technical knowledge and skills to the production of television and other media programs. Students will learn about media production and related operations including sound, video, film and digital media transmission. As part of the program, students may participate in an internship or mentored project related to the field of communication. Support for the development of this program is provided by Maryland Public TV, industry partners, and Maryland colleges and universities.

#### Graphic Communications (PrintED)

For more information about the Graphic Arts Education and Research Foundation and the PrintED program standards, please go to:  
[www.gaerf.org/printed](http://www.gaerf.org/printed)

*The Graphic Communications program* is offered in partnership with the *Printing and Graphics Association MidAtlantic (PGAMA)*. This program of study is designed to give students an overall understanding of the industry and its major operations while teaching academic and technical skills required in the field. Students can gain industry certification through PrintED in several areas, including; Introduction to Graphic Communication, Digital File Preparation, Digital Press and Offset Press. While gaining the technical skills they need to succeed in this career pathway, students can also earn college credits through articulation agreements.

#### Interactive Media Production

- Advanced Interactive Media
- Simulation and Gaming

For more information about the related industry certifications for Adobe Creative Suite, please go to:  
[www.adobe.com](http://www.adobe.com)

For more information about industry certification for web design and the World Organization of Webmasters, please go to: [www.joinwow.org](http://www.joinwow.org)

*The Interactive Media Production program* includes a strong foundation in arts and communication with particular emphasis on graphic and media communications, interactive technologies, and project development. Students complete two foundation courses in *Arts, Media and Communication* and *Interactive Media Production* before selecting one of two options for advanced study – *Interactive Media Production* or *Simulation and Gaming*.

*Interactive Media Production* students gain experience in Internet technology and website development, computer graphics, digital media production and project management. *Simulation and Gaming* students advance their understanding and skill level in computer game design and interactive programming. All students develop a portfolio of their work and may earn certification in Adobe Creative Suite or web design. Graduates may also earn articulated college credit.



### Program Highlight: Graphic Communications (PrintED)

Twenty out of 21 CTE Graphic Communications programs in Maryland have earned the Graphic Arts Education and Research Foundation's industry certifications in PrintED. Students earning certification are eligible for college credit through statewide articulation agreements.



## Business Management and Finance

Maryland CTE programs include a focus on financial services, accounting and finance, marketing, business management, and business administrative support services. These programs include options for students to earn industry certifications and college credit toward advanced study in a business-related career field. Students have the opportunity to take the College Board College-Level Examination Program (CLEP) test in the areas of Financial Accounting, Principles of Management, and Principles of Marketing. Successful completion of these exams allows students to earn college credit for knowledge gained in their high school program. Students may also participate in two career technology student organizations (CTSOs); DECA and FBLA.

### High School CTE Program

### CTE Program Description:

#### Academy of Finance (NAF)

For more information about the National Academy Foundation and the Academy of Finance, please go to: [www.naf.org](http://www.naf.org)

The National Academy Foundation (NAF) Finance Academy provides students with a broad understanding of financial and economic concepts and provides internship opportunities. Students complete a series of courses including Principles of Finance, Accounting, Economics, Securities, Managerial Accounting, Financial Services, Ethics in Business and Applied Finance. Students may also complete an internship to advance their understanding of careers in business and finance.

#### Accounting and Finance

For more information about the Financial Accounting CLEP exam, please go to: [www.collegeboard.com](http://www.collegeboard.com)

Also visit:  
[www.businesseducationmsde.com](http://www.businesseducationmsde.com)

In the *Accounting and Finance* program students learn decision making techniques, financial management, basic accounting principles, business communication skills, problem solving, and teamwork and networking skills. The final two courses in the program focus on advanced accounting and finance knowledge to prepare them for college level courses and entry-level positions in the work force and a capstone course project. Students may also complete a capstone project and/or dual enrollment in college accounting and finance.

#### Marketing

For more information about the Principles of Marketing CLEP exam, please go to: [www.collegeboard.com](http://www.collegeboard.com)

In the *Marketing* program, students learn about the consumer's role, research in global marketing, developing a marketing plan and the importance of ethics and social responsibility. Internships and mentored projects are highly recommended. Graduates may earn college credit through articulation agreements, dual enrollment, or by taking the Principles of Marketing CLEP exam.

#### Business Administrative Services

For information about the industry certification, please visit:  
[www.microsoft.com/learning/mcpl/officespecialist/default.msp](http://www.microsoft.com/learning/mcpl/officespecialist/default.msp)

The *Business Administrative Services* program provides students with knowledge of how to effectively utilize technology in the analysis and communication of business principles. Students are required to complete Office Systems Management I and Office Systems Management II. The second course in the sequence includes coursework in Microsoft Office Applications preparing students for Microsoft Office Specialist (MOS) Certification.

#### Business Management

For more information about the Principles of Management CLEP test, please go to: [www.collegeboard.com](http://www.collegeboard.com)

The program begins with courses in *Principles of Business, Administration, and Management and Financial Management*. The final two courses in the program focus on *Management*, including *Advance Business Management and Capstone course*. This program prepares students for college-level programs in various areas of Business Administration. Graduates may earn college credit through articulation agreements, dual enrollment, or by taking the Principles of Management CLEP exam.



### Program Highlight: Business Management and Finance Program Affiliate

The University of Maryland Eastern Shore (UMES) Department of Business, Management, and Accounting serves as the CTE program affiliate. In partnership with MSDE, UMES provides additional support to these programs, including on-going curriculum development, professional development for teachers and coordination of early college credit and industry certification options for students. For more information, please visit the CTE BMF Affiliate website at: [www.businesseducationmsde.com](http://www.businesseducationmsde.com).



# Construction and Development

Advances in science and technology will continue to drive innovation in the design, construction, and maintenance of buildings and infrastructure, including new design concepts, construction materials and methods, and the application of information technology. Maryland high school construction-related programs allow students to advance their knowledge in specific construction trades, design or construction management.

## High School CTE Program

## CTE Program Description:

### Construction Design and Management

For more information regarding industry certification, please go to: [www.autodesk.com](http://www.autodesk.com)

The *Construction Design and Management* program is currently under development. Students will be engaged in each phase of the design and construction process as they progress through the program. The first two courses require students to use design software to complete several projects and plans, including the use of 3-D modeling tools. In the advanced courses, students work in teams to complete a development project, with emphasis on construction standards; coordination of the construction process; estimating, planning and scheduling; and site management. Students may earn industry certification through Autodesk and/or college credit through articulation agreements with Construction Management programs.

### Construction Trades Professions

- Carpentry
- Electrical
- Plumbing
- Masonry

For more information on program standards, certification and NCCER, please go to: [nccer.org](http://nccer.org)

The *Construction Trades Professions* programs are based on the National Center for Construction Education and Research (NCCER) standards and prepare students for further education and careers in the construction industry, with a focus on *Carpentry, Electrical, Plumbing, or Masonry*. Additional curriculum modules covering project management and project supervision as it relates to all areas of construction are offered as resources and support articulation to postsecondary Construction Management programs. Graduates meet Apprenticeship Training requirements and may earn industry certification and college credit through articulation agreements with community colleges.

### Construction Maintenance

- Heating, Ventilating, Air Conditioning (HVAC)
- Industrial Maintenance
- Welding

For more information on program standards, certification and NCCER, please go to: [nccer.org](http://nccer.org)

The *Construction Maintenance* programs are based on the National Center for Construction Education and Research (NCCER) standards and prepare students for further education and careers in the construction industry, with a focus on *Heating, Ventilating, Air Conditioning (HVAC); Industrial Maintenance; or Welding*. Additional curriculum modules covering project management and project supervision as it relates to all areas of construction are offered as supplemental resources and support articulation to postsecondary *Construction Management* programs. Graduates meet Maryland Apprenticeship Training requirements and may earn industry certification and college credit through articulation agreements with community colleges.



## Program Highlight: Construction Trades and Maintenance

Construction-related programs across the state are using the National Center for Construction Education and Research (NCCER) curriculum, resources and assessments to ensure student preparation and advancement in a wide range of construction careers. Industry partnerships across the state support Maryland students as they advance their technical and business knowledge through work-based learning opportunities and in many cases, through summer employment. Several of Maryland's community colleges use the NCCER standards, allowing easier transition from high school to college programs and apprenticeship.





## Consumer Services, Hospitality and Tourism

Programs in consumer services, hospitality and tourism prepare students for a variety of career options and further education. Each program includes options for students to earn industry certifications and/or college credit in the career field. Students, who are interested in culinary arts, restaurant management, lodging management, or cosmetology, engage in real-world experiences through internships and mentoring opportunities. These allow students to apply their classroom instruction in meaningful ways, and they give them (through licensure or certification) a head start into the profession.

### High School CTE Program

### CTE Program Description:

#### Culinary Arts (ACF)

- Culinary Arts Program
- Baking / Pastry Program

For more information about ACF, please go to: [www.acfchefs.org](http://www.acfchefs.org)

The Culinary Arts program partners with the American Culinary Federation (ACF) to prepare students for successful careers in the food and beverage industry, with a focus on Culinary Arts or Professional Baking. The program includes education in food production, professional cooking, baking, cost control, nutrition, sanitation and food marketing. Students may earn ACF's Certified Junior Culinarian credential and may also earn articulated college credit at Stratford University through a statewide articulation agreement with Stratford.

#### Food and Beverage Management (ProStart)

For more information about industry standards, certification and the NRAEF, please go to: [nraef.org/prostart](http://nraef.org/prostart)

In partnership with the National Restaurant Association Educational Foundation (NRAEF), the ProStart program introduces students to a wide variety of careers within the restaurant, food service and hospitality industry. Students study and practice professional food preparation, international cuisines, food safety and sanitation, customer service relations, accounting, cost control, marketing and lodging management. As part of the program, students complete an industry-mentored work-based learning experience. Students can also earn articulated credit at Stratford University through a statewide articulation agreement with Stratford.

#### Lodging Management Program (LMP)

For more information about CRDS, go to: [www.lodgingmanagement.org](http://www.lodgingmanagement.org)

The Lodging Management Program introduces students to careers within the lodging industry. Students study and experience multiple aspects of the lodging industry including the rooms division, general department and facilities management, marketing and sales, and food and beverage services. The American Hotel and Lodging Educational Institute (AHLEI) designed the program's curriculum and the Certified Rooms Division Specialist (CRDS) credential.

#### Academy of Hospitality and Tourism (NAF)

For more information about NAF AOHT, please go to: [www.naf.org](http://www.naf.org)

In partnership with the National Academy of Foundation (NAF), the Academy of Hospitality and Tourism prepares students for postsecondary education and careers in one of the world's largest service industries, hospitality and tourism. All AOHT students first take Principles of Hospitality & Tourism for a broad introduction to the core concepts at the heart of the hospitality industry. Students then take courses in customer service, geography, hospitality marketing, sports, entertainment and event planning, and sustainable tourism as well as complete an internship. In addition to the internship, students may also complete a college-level course during the senior year of high school.

#### Careers in Cosmetology


For more information about industry requirements and licensing in Maryland, please go to MD State Board of Cosmetology at [www.dllr.state.md.us](http://www.dllr.state.md.us)

The Careers in Cosmetology program prepares individuals to care for and beautify hair, skin and nails. Students are instructed in the art and science of cosmetology as well as all aspects of the industry. Emphasis is placed on hygiene, safety and sanitation as well as State Board of Cosmetologists' rules and regulations. Related areas of instruction include human anatomy and physiology; mathematics and measurement; and chemistry. Salon management is an integral part of the classroom and clinical experience. The 1,500 hour program includes classroom instruction, clinical experience, related mentored work-based learning experience and a senior capstone project. Upon successful completion of the program, the student are required to take the Maryland State Board of Cosmetologists' Examination.



### Program Highlight: Culinary Arts

The American Culinary Federation (ACF) program prepares students for careers and further education in professional cooking or baking. Thirteen Maryland high schools are accredited in culinary arts and/or professional baking—a one and a half year process that includes curriculum review, site visits, and assessments. Students completing the program earn ACF's Certified Junior Culinarian credential.



# Environmental, Agriculture and Natural Resources

The agricultural sector is a highly competitive global industry creating new challenges in identifying global and domestic markets; improving business planning, financing, risk management, and productivity; and reducing costs. Advances in science and technology, in particular biotechnology, will continue to drive innovation and growth in this career cluster. Growing public concerns over natural resources, environmental quality, and public health will continue to expand the role and scope of the natural resource management and environmental services sectors.

## High School CTE Program

### Curriculum for Agriculture Science Education (CASE)

For more information, please go to  
[www.case4learning.org](http://www.case4learning.org)

## CTE Program Description:

The *Curriculum for Agriculture Science Education* (CASE) is a national program of study that offers students a rigorous curriculum designed to challenge students to perform at high levels. Through the use of activities, projects and problem-solving, students explore agriculture subject matter while they learn necessary knowledge and skills. To establish these requirements, CASE incorporates the National Academic Standards and Agriculture Food and Natural Resources (AFNR) Content Standards. The program is a four-course sequence and will offer students the opportunity to earn college credit upon successful program completion. For more information about CASE, please see the program highlight at the bottom of this page.

### Horticultural Services: Certified Professional Horticulturist (CPH)

For more information about industry requirements, please go to Maryland Nursery and Landscape Association:  
[www.mnlaonline.org](http://www.mnlaonline.org)

The *Horticultural Services* program of study is based on requirements for the Certified Professional Horticulturist (CPH) certification used by the Maryland "Green Industry." Students complete a sequence of courses which include including: Introduction to Environmental/Plant/Animal Science, Foundations of Horticulture, Plant Production, and Landscape Design and Management. Students have the opportunity to earn the Student-Level CPH certification by taking and passing the industry exam.

### Environmental Studies/Natural Resources

The *Environmental Studies/Natural Resources* program of study is composed of a four-course sequence that covers both environmental and natural resource management technologies and current issues related to these fields of study. This program incorporates green technologies and the impact of today's environment on our natural resources. The program includes an emphasis on research and the ethics involved in making decisions that impact our ecosystem. Students will engage in technical research and writing as it relates to real-world problem solving. Students will also have the opportunity to earn college credit through articulation agreements with Maryland colleges (currently under development).



### Program Highlight: Curriculum for Agriculture Science Education (CASE):

In this program, students learn about all aspects of agricultural sciences and may take additional courses based on their area of interest. The following courses will be offered as part of the program:

- Introduction to Agriculture, Food and Natural Resources
- Principles of Agricultural Sciences - Plant
- Principles of Agricultural Sciences - Animal
- Animal and Plant Biotechnology
- Food Science and Safety
- Agricultural Business, Research and Development



"CASE is the most powerful tool available for the advancement of agricultural education and enhancement of student learning of agricultural science subject matter."

*National Association of Agricultural Educators*



## Health and Biosciences

Career and Technology Education programs in the Health and Biosciences Cluster focus on preparing dedicated professionals with the knowledge and skills necessary to pursue challenging and rewarding careers and further education. These programs require students to apply knowledge learned in science and mathematics to professions in the Health and Biosciences field. These careers are among the fastest growing and highest in demand in the country as the population ages and health care needs continue to increase. These CTE programs prepare students for positions in direct patient care settings, research and laboratory facilities, as well as for opportunities in business and management related to health care. The Health and Biosciences Cluster also provides career development experiences for students who want to pursue careers in the medical professions including physicians, research scientists, nurses, and a wide variety of exciting careers.

### High School CTE Program

#### Academy of Health Professions (AHP)

- CNA / GNA
- Pharmacy Tech
- Dental Assistant

For more information about Board of AHP program visit: [MarylandAHP.org](http://MarylandAHP.org)

### CTE Program Description:

The *Academy of Health Professions* program uses project and problem-based learning, clinical experiences, as well as classroom and lab instruction to teach students about the field of health care. Students progress through two foundation courses: *Foundations of Medicine and Health Science* and *Structure and Functions of the Human Body*. Opportunities for students to apply what they are learning to real-life health care situations are part of a specialized health care course. Students will also have the opportunity to earn state and/or nationally recognized certifications, and/or college credit through articulation agreements with local colleges. Stevenson University provides on-going curriculum and professional development to AHP teachers.

#### Biomedical Sciences: Project Lead The Way (PLTW)

For more information about Project Lead The Way, please go to: [Stevenson.edu/pltw/](http://Stevenson.edu/pltw/)

The Biomedical Sciences program is based on the national content standards for Science, Mathematics, and English Language Art and the Accountability Criteria for the national Health Care Cluster Foundation Standards. The program consists of a sequence of four courses: *Principles of the Biomedical Sciences*, *Human body Systems*, *Medical Interventions*, and *Biomedical Innovations*. Students who complete the program are prepared for employment and further education. Stevenson University, Maryland's PLTW Biomedical Sciences Affiliate University, offers transcribed credit to students who successfully complete the program.

### Program Highlight: Biomedical Sciences

Maryland is one of the first states in the country to implement the Biomedical Sciences program developed by Project Lead the Way (PLTW). Instructors in the program report that their students are very engaged in and highly motivated by the structure and content of the program. The PLTW Biomedical Sciences program is a problem and project-based curriculum where students work to solve real-world problems using scientific methods and research techniques. The science content of the first course is well aligned to Maryland's Biology HSA and reinforces what students are learning in their science courses. The goal of the PLTW program is to produce an increasing and more diverse group of students to be successful in science, engineering and biotechnology programs at the four and two-year college level. Students enrolled in the program take the following sequence of courses: *Principles of the Biomedical Sciences*, *Human Body Systems*, *Medical Interventions*, and *Biomedical Innovations*. Stevenson University provides professional development to the PLTW Biomedical Sciences instructors.



“Biomedical Sciences careers are among the fastest growing in Maryland, and that’s why, together, we’re preparing our students by giving them the tools they need to compete and win in a rapidly changing 21st century economy.”

- Governor Martin O'Malley





## Human Resource Services

Advances in scientific knowledge, and increased public awareness of social problems and issues are contributing to a demand for high-quality social services. Public concerns over crime, security, and emergency response and the increased demand for legal intervention in business and communities will continue to drive the growth of law enforcement, emergency and legal services. The continuous need for education professionals, especially in the critical shortage areas, offers creative ways to engage young people early on in the teaching profession.

### High School CTE Program

#### Fire Science: Maryland Fire and Rescue Institute (MFRI)

For more information about the Maryland Fire and Rescue Institute, go to: [www.mfri.org](http://www.mfri.org)

#### Homeland Security and Emergency Preparedness:

- Homeland Security Sciences
- Criminal Justice and Law Enforcement
- Information and Communications Technology

For more information about the STARS GIS Technician Certification, please go to: [mset.org/stars\\_certify.php](http://mset.org/stars_certify.php)

### CTE Program Description:

The *Fire Science* program is offered in partnership with instructors from the Maryland Fire and Rescue Institute (MFRI) of the University of Maryland. Students progress through courses on fire prevention and control and emergency medical technology. The program includes classroom instruction as well as formal training at local fire companies. Students are required to complete work-based learning and take the seven certification exams.

The *Homeland Security and Emergency Preparedness* (HS/EP) program prepares students for industry certification and college credit in one of three areas: *Homeland Security Sciences*, *Criminal Justice and Law Enforcement*, or *Information/Communications Technology*. All students complete a foundation-level course with a focus on protecting against threats to public safety through effective communication, preparedness, detection, prevention, response and recovery. Students completing the *Homeland Security Sciences* program complete additional courses in *Homeland Security Science Research Methods and Applications*. Students completing *Criminal Justice and Law Enforcement* complete an additional course in *Administration of Justice* and participate and an internship as part of the program. Students in the *Information/Communications Technology* courses focus on Geographic Information Systems (GIS) and Remote Sensing (RS) technology leading to the *STARS Entry-Level GIS Technician Certification*.

#### Legal Support Services

The *Legal Support Services* program is currently under development. This program will provide an overview of law, legal terminology and documentation, research, court related services and professional standards and ethics. This program will prepare students for legal services and for college law-related programs.

#### Childcare and Early Childhood Education

The *Childcare and Early Childhood Education* program will be developed to provide an overview of learning theory and practice with an emphasis on early childhood. This program will prepare graduates to teach students ranging in age from infancy through eight years. Students will also have the opportunity to earn industry certification and college credit.

#### Teacher Academy of Maryland (TAM)

For more information about teaching requirements go to : [www.marylandpublicschools.org](http://www.marylandpublicschools.org)

For more information about the ParaPro certification, please visit: [www.ets.org](http://www.ets.org)

The *Teacher Academy of Maryland* program prepares students for further education and careers in the education profession. The program focuses on human growth and development through adolescence, teaching as a profession, curriculum and instruction and an education academy internship. Upon completion of the program and passing the ParaPro test or PRAXIS I, high school graduates are ready for employment in the teaching profession. This program is based on the outcomes of the Maryland Associate of Arts in Teaching (A.A.T.) degree, which aligns with the National Council for the Accreditation of Teacher Education standards.



For more information:  
[towson.edu/coe/tam/index.asp](http://towson.edu/coe/tam/index.asp)

### Program Highlight: Teacher Academy of Maryland (TAM)

The Teacher Academy of Maryland (TAM) introduces students to the teaching profession and gives them a jump on college coursework. TAM students can enroll directly in a four-year college with a teacher education program, netting credit for their high school program. Or they can enroll in any of the 13 community colleges statewide that offer the articulated Associate of Arts in Teaching degree—a two-year degree whose coursework transfers to any in-state 4-year college (public or private) with a teacher-preparation program. Towson University, which graduates about one in every four teacher candidates—far more than any other college in Maryland—is the state's program partner, offering both transcribed credit and scholarships to TAM graduates.





# Information Technology

Information technology (IT) professionals will face increasing pressure to design, develop, implement, and support more complex and reliable IT solutions that will meet the needs of external and internal customers. This will require that IT professionals have the skills to determine customer and business needs and requirements, manage complex projects, and integrate software and hardware solutions. Maryland CTE programs include opportunities for students to focus on software development, programming, IT hardware and networking technologies. Cyber Security is an increasingly important part of IT programs and represents expanding opportunities for employment and advanced education and training in Maryland.

## High School CTE Program

## CTE Program Description:

### Academy of Information Technology (NAF)

- IT Programming
- IT Networking
- Web Design

For more information about NAF, please go to: [www.naf.org](http://www.naf.org)

In partnership with the National Academy Foundation (NAF), the *Academy of Information Technology* prepares students for post-secondary education and careers in a wide range of Information Technology (IT) careers. All students complete foundation-level courses in computer science and then choose an area of specialization. Students may focus on programming, networking, or web design options. Industry certification is available through Microsoft, CompTia, Cisco, Oracle and WOW based on the program option selected.

### Database Academy (Oracle)

For more information about Oracle, please go to: [www.academy.oracle.com](http://www.academy.oracle.com)

The *Database Academy (Oracle)* program prepares students for successful careers in database administration, database programming, IT consulting, IT project management, and computer engineering. The Oracle Academy is a two-year program that includes database programming and programming for web-based applications. Each course of the Oracle Academy prepares students for the Oracle Certified Associate (OCA) certification.

### IT Networking Academy (CISCO)

For more information about the Cisco Academy and Cisco certifications, please go to: [www.cisco.com](http://www.cisco.com)

The *IT Networking Academy (Cisco)* prepares students for advanced study in IT and for industry certification, the first step in an IT career path. Students learn how to install and configure switches and routers in multiprotocol networks using local- and wide-area networks; provide troubleshooting service; and improve network performance and security. The high school program for the IT Networking Academy starts with a foundation in computer hardware and software basics. Students advance their understanding of IT and may earn a range of industry certifications, such as CompTIA (A+, Net+) and Cisco CCENT.

### IT Computer Science and Cyber Security

The *Computer Science and Cyber Security* program includes a sequence of four courses, starting with an overview of the Computing and Information Technology field and progressing through a more in-depth study of computer science. Students will learn all aspects of Computer Science. Students will learn all aspects of Computer Science, including programming, networks, graphics, databases, cyber security, artificial intelligence, and other applications in IT. Students may earn college credit for introductory level computer science and cyber security courses. Certification options are also available, including the Microsoft Technology Associate (MTA).



## Program Highlight: IT Networking Academy (Cisco)

The IT Networking Academy (Cisco) prepares students for advanced study in a wide range of IT careers, including networking, cabling and wireless technologies. More than 3,000 students are enrolled in Cisco Academies across Maryland at the high school and college level. Cyber Security is an increasingly important part of Information Technology (IT) programs and represents expanding opportunities for employment and advanced education and training in Maryland. As students progress through these IT programs, additional options for Cyber Security and Information Assurance is provided.



# Manufacturing, Engineering, and Technology

Programs in the Manufacturing, Engineering, and Technology Cluster prepare students for a variety of career areas, including opportunities to become engineers, engineering technologists or technicians. Students engage in real-world projects that strengthen their understanding of science, technology, engineering, and mathematics. By completing challenging projects related to design, manufacturing process applications and quality improvements, they are being educated for the high-performance workplace using advanced technologies. To remain internationally competitive, employers need employees who can develop and use new technologies that will continuously improve the quality of life for Marylanders.

## High School CTE Program

## CTE Program Description:

### Pre-Engineering: Project Lead The Way (PLTW)

- Computer Integrated Manufacturing
- Civil Engineering
- Biotechnical Engineering
- Aerospace Engineering

For general information about PLTW, please go to: [www.pltw.org](http://www.pltw.org)

The *Pre-Engineering: Project Lead The Way (PLTW)* program prepares students for further education and careers in engineering and engineering technology. Students complete foundation-level courses in Engineering, including: *Principles of Engineering*, *Introduction to Engineering Design*, and *Digital Electronics*. Students then select an area of specialization, including: *Computer Integrated Manufacturing*, *Civil Engineering and Architecture*, *Aerospace Engineering* or *Biotechnical Engineering*. In the final course, students complete an industry-mentored capstone project in Engineering Design and Development. Students who qualify can earn transcribed credit at PLTW-affiliated colleges and universities nationwide, including the University of Maryland-Baltimore County.

### Manufacturing Engineering Technologies

The *Manufacturing Engineering Technologies* program is designed to prepare students for the manufacturing industry and includes a focus on Manufacturing Process Design and Development, Production, Supply Chain Logistics, Health, Safety and Environment, and as well as Quality Assurance and Continuous Improvement. Course content aligns with the standards outlined in the National Institute for Metalworking Skills (NIMS). Students who qualify can industry-recognized credentials and/or early college credit. The Manufacturing Engineering Technologies program aligns to national standards for the Advanced Manufacturing Industry. The focus is applying lean methodology and tools to effectively implement continuous improvement for success in a global, competitive business environment.

### Program Highlight: Project Lead The Way Pre-Engineering

Maryland's Project Lead The Way (PLTW) Pre-Engineering program is the fastest growing CTE program in the state. Currently, 21 school systems offer the program which is focused on increasing the number of students prepared for college and STEM-related careers—specifically women and minorities who are underrepresented in the field. Nationally, the benefits of the program are:

- PLTW alumni are 5-10 times more likely to be studying engineering and technology.
- PLTW students have a higher retention rate in college engineering and science programs
- 97% of PLTW seniors intend to pursue a four-year degree or higher, whereas the national average is 67%.



"A solid foundation in math and science broadens the higher education and career opportunities available to students. Students who participate in Maryland's PLTW Engineering Program arrive at our campus well prepared to complete a degree in engineering or another STEM-related field."

- Freeman Hrabowski, President  
UMBC - PLTW Affiliate University



## Transportation Technologies

Advances in science and engineering are producing major innovations in transportation technology, resulting in faster movement of people and goods at lower costs and with less environmental and safety risks. These innovations require higher skills to manage and maintain transportation equipment. High school programs provide opportunities for students to prepare for careers in the automotive industry or to explore aerospace engineering opportunities.

### High School CTE Program

### CTE Program Description:

#### Automotive Technician (NATEF)

For more information about the National Automotive Technicians Education Foundation (NATEF) standards and industry certification, please go to: [www.natef.org](http://www.natef.org)

The *Automotive Technology* program incorporates the Automotive Service Excellence (ASE) program certification standards and the National Automotive Technicians Education Foundation (NATEF) standards. The NATEF accreditation model is being updated and broadened to include all eight certification areas: *Suspension and Steering, Brakes, Electrical/Electronic Systems, Engine Performance, Engine Repair, Heating and Air Condition, Automatic Transmission and Transaxle, and Manual Drive Train*. The Maryland automotive Technology Program is being reconfigured to fully align with the new NATEF model. Each course is aligned to Industry requirements for certification and success in the field. The end-of-course assessment provides students the opportunity to earn an ASE student achievement certificate and college credit.

#### Autobody/Collision Repair Technician (NATEF)

For more information about the NATEF, please go to: [www.natef.org](http://www.natef.org)  
For information about the Inter-Industry Conference on Auto Collision Repair, please go to: [www.i-car.com](http://www.i-car.com)

The *Autobody/Collision Repair Technician* program combines technical, academic and workplace skills in an integrated curriculum in accordance with the Inter-Industry Conference on Auto Collision Repair (I-CAR), National Automotive Technicians Education Foundation (NATEF), and Automotive Service Excellence (ASE) guidance and directives. The program consists of the following courses: *Non-Structural Analysis & Damage Repair, Paint and Refinishing, and Structural Analysis and Damage Repair*. Each course has a NATEF end-of-course assessment providing students the opportunity to earn an ASE student achievement certificate and college credit.

#### Medium-Heavy Truck Technician (NATEF)

For more information about the NATEF standards and industry certification, please go to: [www.natef.org](http://www.natef.org)

The *Medium/Heavy Truck Technician* program combines technical, academic and workplace skills in an integrated curriculum in accordance with all National Automotive Technicians Education Foundation (NATEF) guidance and directives. The program consists of the follow courses *Diesel Engineering, Suspension and Steering, Brakes, Electrical/Electronic Systems, and Preventive Maintenance*. Each course has a NATEF end-of-course assessment providing students the opportunity to earn an ASE student achievement certificate and college credit.



### Program Highlight: Automotive Technician

NATEF was founded to develop, encourage, and improve automotive technician education. NATEF examines the structure and resources of training programs and evaluates them against nationally accepted standards of quality. NATEF's precise national standards reflect the skills that students must master. The NATEF evaluation process ensures that accredited training programs meet or exceed industry-recognized, uniform standards of excellence.

Learn more about Achieving Natef Accreditation for all three Automotive Training Programs at: <http://natef.org/documents.html>

## CAREER AND TECHNOLOGY EDUCATION



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## EDUCATING TOMORROW'S WORKFORCE TODAY

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